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IMPROVED PROTECTIVE COATINGS FOR SONAR DOMES.(U)
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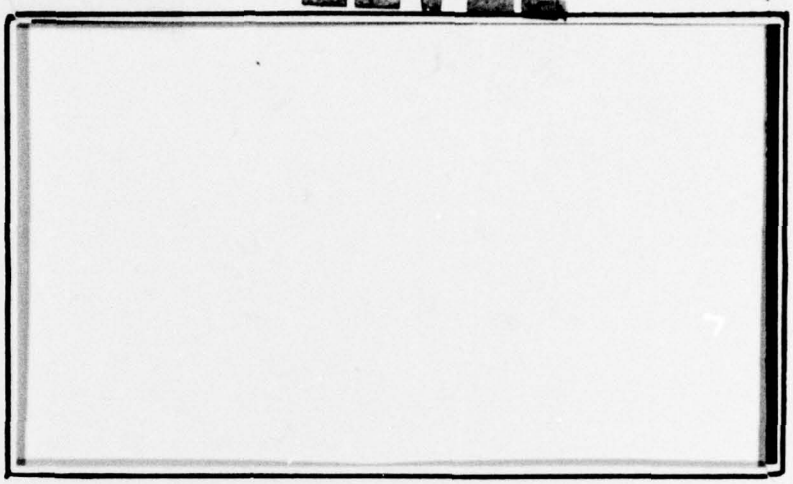

TECHNICAL MEMORANDUM

U.S. NAVAL APPLIED SCIENCE LABORATORY
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BROOKLYN, NEW YORK 11251

USNASL-9110-P-1J(REV. 10-64)

IMPROVED PROTECTIVE COATINGS FOR SONAR DOMES

Lab. Project 9300-43, Technical Memorandum #3

SS 041-001, Task 8481/2

10 AUG 1965

N. J. Petito

NASL-9300-43-TM-3

MATERIAL SCIENCES DIVISION

Approved: D. H. Kallas

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Lab. Project 9300-43
Technical Memorandum #3

Ref: (a) NAVAPLSCIENLAB Program Summary, Tasks 1201/2 and 8481/2, Improved Protective Coatings for Sonar Domes of 1 May 1965
(b) Lab. Project 9300-43, Tech Memo #2, Improved Protective Coatings for Sonar Domes of 12 May 1965
(c) NAVAPLSCIENLAB ltr 9370:AWC:nr, Lab. Project 9300-43 of 26 Mar 1965
(d) Visit of N. J. Petito NAVAPLSCIENLAB to NAVUWTRSOUNDLAB, New London, Conn. on 30 Jun 1965
(e) Lab. Project 9300-43, Tech Memo #1 of 15 Jul 1964
(f) NAVUWTRSOUNDLAB Tech Memo #933-385-64 of 27 Nov 1964

1. In accordance with reference (a), development of sonar dome coating systems which will have good erosion resistance and anti-fouling properties and be able to withstand exposure to high level pulse fields generated by current high power sonar systems, is continuing at the U. S. Naval Applied Science Laboratory. As part of the overall program, preliminary evaluations are being made of commercially available coatings using the Ultrasonic Tank Test and the NASL Cavitating Disk Apparatus described in reference (b). Coatings selected on the basis of this Laboratory screening are applied to sections of sonar domes which are then exposed to high power sonar transmission at a U. S. Naval Underwater Sound Laboratory test site. This report covers a visit, reference (d), made by a Laboratory representative to inspect one such dome section which had been coated with two variations of a coating system containing a moisture cured, modified polyurethane material.

2. The topics covered in this report deal specifically with:

(1) the appearance of the coating under study

(2) observations on an indirectly related corrosion problem

(3) recommendations for solving this corrosion problem

(4) brief comments on future Laboratory plans

3. When subjected to the Ultrasonic Tank Test and to the NASL Cavitating Disk Apparatus, the two variations of the polyurethane coating system, designated as 22F and 11G in Tables 3 and 4 of reference (b), showed promising cavitation erosion resistance. The coating compositions as reported in reference (b), were as follows:

Component	System 22F	System 11G
Navy Formula 117	1 Coat	1 Coat
Navy Formula 120	1 Coat	1 Coat
Dupont RP 5005 Black Sealant	3 Coats	2 Coats
Dry Film Thickness (Average)	13 Mils	11 Mils

On the basis of these favorable results, the Laboratory applied each of these coating systems to one half of the interior and exterior of a 5 ft x 5 ft SQS-26 sonar dome test section. The coated dome was then forwarded to the U. S. Naval Underwater Sound Laboratory, reference (c), for simulated service tests.

4. On the occasion of reference (d), a Laboratory representative made two significant observations related to the condition of the service tested coated sonar dome section. The dome had been exposed continuously for 243 hours to high power sonar transmissions while immersed in sea water at the South Pier (Thames River), of the NAVUWTRSOUNDLAB test facility, New London, Connecticut. These observations were as follows:

a. The exterior and interior surfaces of the coated dome sections were in "very good" condition based on the absence of blistering, peeling, or any other visual signs of coating deterioration, which might have been produced by cavitation attack of the sonar transducer field.

b. Corrosion was present on the interior sections of the coated dome, in the voids (created by intermittent welds) between the trusses and the skin of the dome. This defect could be attributed to the difficulty in obtaining good surface preparation and adequate coverage in these inaccessible areas and not to deficiencies in the coating system. The observed corrosion failures confirmed defects reported by NAVUWTRSOUNDLAB, under reference (f) for previously submitted coated domes.

5. Relative to the observations noted above, the following plans were considered:

a. The already imposed 243 hour exposure period of the dome would be extended to a total of 450 hours, after which the coating would again be examined. The 450 hour exposure was considered by NAVUWTRSOUNDLAB to be better suited for a comparison of the test coating with other similarly exposed coatings.

b. In view of the persisting corrosion problem in the skin-strut void areas, the Laboratory representative made two recommendations for effecting a solution. (1) That the voids be filled with a smoothign compound, or (2) that welds of the strut to the skin be made continuous to eliminate the voids entirely.

6. A basis for the void filling recommendation may be found in an earlier study, reported in reference (e). This was a study of a sonar dome section in which some of the voids were filled with an epoxy smoothing compound and in which two halves of the section were coated, one half with a vinyl coating system and the other half with an epoxy coating system. It was noted by NAVUWTRSOUNDLAB in reference (f), that after service exposure, the filler adhered well to the metal surfaces; that the coatings adhered well to the filler; and that void filling might prove effective in reducing corrosion in the vulnerable areas.

7. Work planned for the future includes the following:

a. A test to determine compatibility and adhesion characteristics of the 22F and 11G polyurethane compound when applied over several candidate void filling smoothing compounds.

b. Laboratory screening of coatings will be extended to include a newly installed facility for exposing specimens to sonic pulsations from an SQS-26 sonar transducer. Details of this installation will be included in a later report.

c. Development of the 22F and 11G polyurethane compound will continue and will include combination of this compound with necessary tie-coatings and anti-fouling top-coatings.

8. The next progress report will detail all work performed since issuance of reference (a).

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